**Lesson Title: What is an Ellipse, part one**

**Standard(s):**

G.GPE.3 – geometric properties with equations, ellipses and hyperbolas

**Summary:**

Students will create a series of drawings in order to discover the similarities and differences between an ellipse and a circle and determine how the distance between foci changes an ellipse.

**Learning Goals:**

1. Learn what an ellipse looks like.

2. Determine how the distance between the foci changes an ellipse.

**Vocabulary:**

Ellipse

**Time:**

This lesson should take about 45 minutes depending on the student’s speed of learning and the size of the class.

**Grouping:**

Students should work in groups of 3 to 4.

**Materials:**

For each group:

- foam-core or cardboard

- piece of paper that covers the board with Cartesian plane, origin at center of paper, 1” scale

- 2 push pins

- piece of string, tie each end to one of the pins

**Lesson Plan:**

1. (10 min) Review the concept of a circle by asking students to produce the equation from memory, write it on the board. Ask students to draw a circle with radius equal to half of the distance of the string/pin assembly (alternatively, students could have drawn the circle during a previous lesson on circles). All drawings in this lesson will be centered at the origin of the coordinate plain on the same piece of paper.
2. (10 min) Introduce the idea of a dog tied to a leash and able to run in a circle around a single point. Ask students what would happen if the leash is attached to two trees in the backyard such that the dog can run along the length of the leash. Demonstrate drawing an ellipse with the string/pin assembly. Have students draw an ellipse using 2 pins placed 4” apart, or each pin is 2” from origin.
3. (10 min) Discuss the new shape, ask students to describe it. Tell them it is called an ellipse. Ask students what would happen if the pins were moved further apart. Then, have students draw an ellipse with the 2 pins at 6” apart, or each pin is 3” from origin.
4. (8 min) Ask groups to work through the prompting questions:

What happens if the pins are moved further apart? (answer: top and bottom squish)

How far apart can the pins get without changing the string? (answer: diameter of circle)

What happens if the pins are moved closer together? (answer: top and bottom balloon)

What if the pins are at the same point in the middle? (answer: you get a circle)

1. (7 min) Closure: as a class, briefly discuss the answers to the prompting questions to make sure everybody understands. Tell class that next lesson will include the equation and more terminology. Assign homework.

**Homework:**

Write in your journal. Tell in your own words what an ellipse is and answer these questions:

* + Which configuration of pins would give the dog the greatest area to play in?
  + Which configuration of pins would give the dog the least area to play in?
  + What happens to the shape of the dog’s play area if the leash is made longer?

**Next lesson covers:**

* Give equation of ellipse and define focal point and foci.
* Have students graph many different equations of ellipses to see how the shape changes.
* Show how similar the equation is to that of a circle.
* Is a circle a special type of ellipse?